Fishery Data Series No. 03-26

Escapement, Terminal Harvest, and Fall Fry Tagging of Chilkat River Chinook Salmon in 2002

by

Randolph P. Ericksen

December 2003

Alaska Department of Fish and Game **Division of Sport Fish**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	v
watts	w

General

all commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
all commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
and	&
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
id est (that is)	i.e.,
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

alternate hypothesis	H_A
base of natural logarithm	E
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, χ^2, etc.
confidence interval	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	X
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	var

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This investigation was partially financed by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777K) under Project F-10-17 and F-10-18, Job No. S-1-5 and NOAA Grant No. 17FP2457 (U. S. Chinook Letter of Agreement).

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This document should be cited as:
Ericksen, Randolph P. 2003. Escapement, terminal harvest, and fall fry tagging of Chilkat River chinook salmon in 2002. Alaska Department of Fish and Game, Fishery Data Series No. 03-26, Anchorage.

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ABSTRACT

The harvest of chinook salmon *Oncorhynchus tshawytscha* in the spring Haines marine sport fishery and escapement into the Chilkat River are estimated annually to monitor this important sport fishery and the salmon stock that supports it. We used an age-stratified mark-recapture experiment to estimate spawning abundance of age-1.2 and older chinook salmon returning to the Chilkat River in 2002. Angler effort and harvest of wild mature chinook salmon in the Haines spring marine boat fishery were estimated using an onsite creel survey. Harvest of large (≥28 inches total length) chinook salmon and chartered angler effort and harvest were also estimated.

We captured 445 medium and large (age-1.2 and older) chinook salmon with drift gillnets and fish wheels; 443 of these were tagged with solid-core spaghetti tags in the lower Chilkat River between June 10 and August 5, 2002. We examined 707 medium and large chinook salmon on spawning tributaries to the Chilkat River, and 68 of these were marked. We estimated that 4,424 (SE = 450) chinook salmon age-1.2 and older immigrated into the Chilkat River during 2002. An estimated 373 (SE = 123) were medium (age-1.2), and 4,051 (SE = 433) were large (age-1.3 and older) fish.

An estimated 7,769 angler-hours (SE = 636) of effort (7,566 targeted salmon hours, SE = 634) were expended in the spring Haines marine sport fishery for a harvest of 337 (SE = 40) chinook salmon (≥28 inches), of which 272 (SE = 37) were wild, mature fish. Chartered anglers accounted for 12% of the targeted salmon effort and 21% of the harvest of large chinook salmon.

Wild chinook salmon fry were trapped in three locations of the Chilkat River drainage during fall 2002. We captured and released a total of 31,390 fry with coded wire tags in 2002. They averaged 68 mm (SE = 0.3) in fork length. Future recoveries of these fish will allow us to estimate fall rearing abundance and marine harvest of these brood years.

Key words: mark-recapture, creel survey, angler effort, harvest, marine boat sport fishery, escapement, coded wire tag, age composition, length-at-age, chinook salmon, *Oncorhynchus tshawytscha*, Chilkat River, Kelsall River, Tahini River, Big Boulder Creek, Little Boulder Creek, Haines, Southeast Alaska

INTRODUCTION

The Chilkat River drainage produces the third or fourth largest run of chinook salmon *Oncorhynchus tshawytscha* in Southeast Alaska (McPherson et al. 2003). This large glacial system has its headwaters in British Columbia, Canada, flows through rugged, dissected, mountainous terrain, and terminates in Chilkat Inlet near Haines, Alaska (Figure 1). The mainstem and major tributaries comprise approximately 350 km of river channel in a watershed covering about 1,600 km² (Bugliosi 1988). Chilkat River chinook salmon rear primarily in the inside waters of northern Southeast Alaska, and less so in the Gulf of Alaska, Prince William Sound, and Kachemak Bay (Pahlke 1991, Johnson et al. 1993, Ericksen 1996, 1999).

A spring marine boat sport fishery occurs annually in Chilkat Inlet (Figure 1) in Southeast Alaska near Haines and targets the run of mature chinook salmon to the Chilkat River. A creel survey has been used to estimate harvest in this fishery since 1984. The harvest in this fishery peaked at over 1,600 chinook salmon in 1985 and 1986 (Neimark 1985; Mecum and Suchanek 1986, 1987; Bingham et al. 1988; Suchanek and Bingham 1989, 1990, 1991; Ericksen 1994–2002a). The fishery in Haines contributes significantly to the local economy, supports a salmon derby, and is popular both with local and non-local anglers (Bethers 1986, Jones and Stokes 1991).

Beginning in 1981, the Alaska Department of Fish and Game (ADF&G), Division of Sport Fish began a program to provide index counts to monitor escapement trends of chinook salmon abundance in the Chilkat River (Kissner 1982) using aerial survey counts in Stonehouse and Big Boulder creeks (Figure 1). These areas were selected because they were the only clearwater

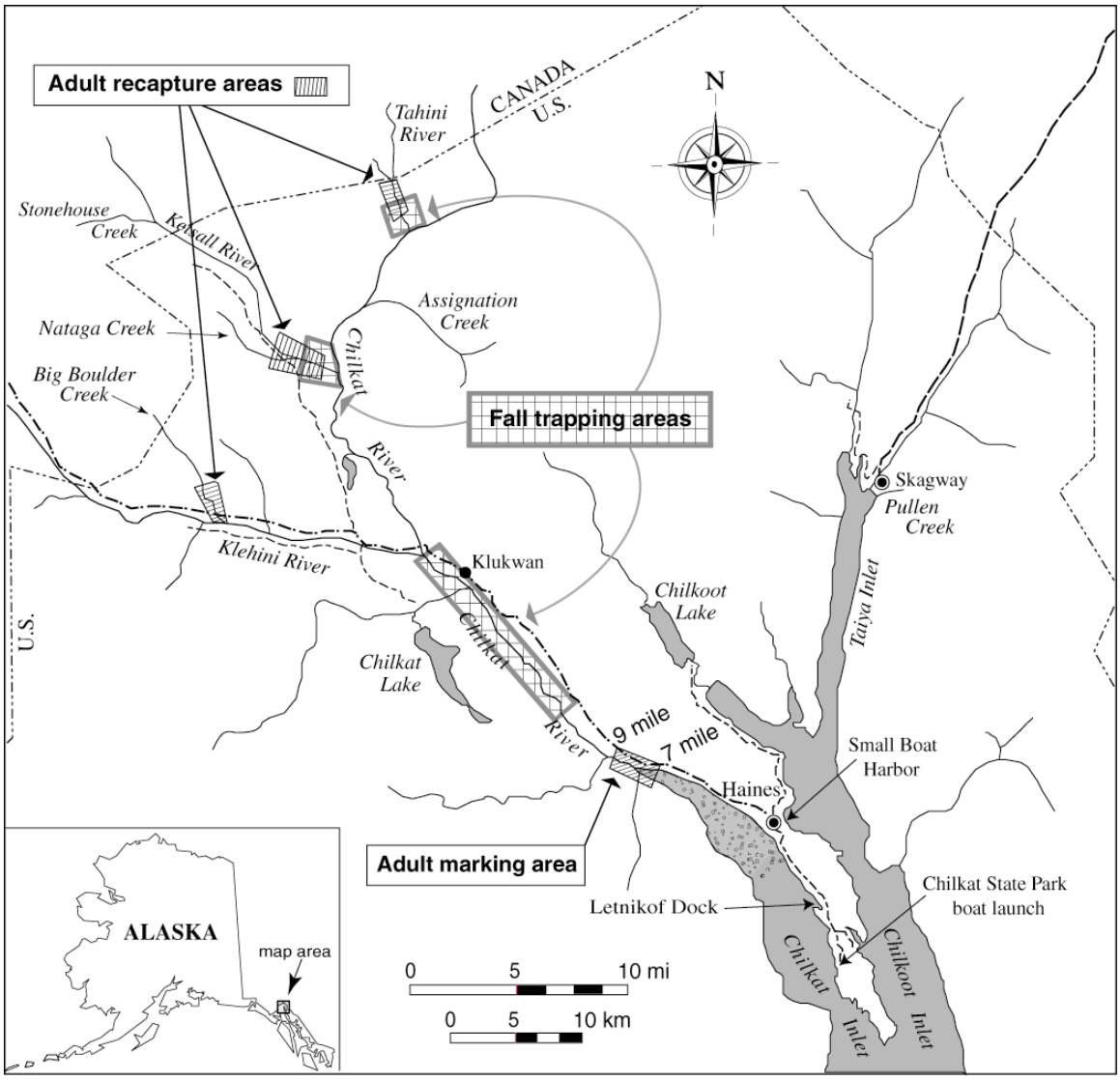


Figure 1.–Location of sampling sites and release sites of coded wire tagged chinook salmon near Haines and Skagway in Southeast Alaska, 2002.

spawning areas that could provide standardized, consistent survey counts. The indices were used in a regionwide program to monitor chinook salmon escapements in Southeast Alaska (Pahlke 1992).

Concern about Chilkat River chinook salmon developed when aerial survey counts declined in 1985 and 1986. This decline coincided with increasing marine harvests of chinook in the commercial troll, commercial drift gillnet, and sport fisheries in the area. In 1987, the Department began to restrict fisheries in upper Lynn Canal, and recreational fisheries were closed entirely in 1991 and 1992. The Haines King Salmon Derby was closed between 1988 and 1994.

Because of these concerns, the Division of Sport Fish conducted a coded wire tagging (CWT) program on wild juvenile chinook salmon in 1989 and 1990 to identify migratory patterns and to estimate contributions to sport and commercial fisheries (Pahlke 1990, 1991). The Division of Sport Fish also conducted radiotelemetry and mark-recapture experiments in 1991 and 1992 to

estimate spawning distribution and abundance of large (age-1.3 and older) chinook salmon in the river. Results of this research indicate that most chinook spawn in two major tributaries of the Chilkat River, the Kelsall and Tahini rivers, and that immature fish are harvested primarily in the inside waters of Southeast Alaska (Johnson et al. 1992, 1993; Ericksen 1996, 1999). Escapements since 1991 have ranged between 2,035 (SE = 334) in 2000 and 8,100 (SE = 1,193) in 1997 (Johnson et al. 1992, 1993; Johnson 1994; Ericksen 1995–2002a).

The current Chilkat River escapement goal of 2,000 chinook salmon was established in the late 1970s and is currently under review. Regulations in effect during 2002 prevented sport fishing for chinook salmon near the mouth of the Chilkat River (Figure 1). Regionwide regulations allowed resident, non-guided anglers to keep two king salmon 28 inches or greater in length per day and in possession. Nonresident, and guided anglers were allowed to keep one king salmon 28 inches or greater in length per day and in possession. A nonresident angler annual limit of three king salmon 28 inches or greater in length was also in effect during 2002. In addition, effective June 13, the daily bag and possession limit for king salmon <28 inches in length was one for anglers fishing in Taiya Inlet. This regulation was implemented to allow anglers to harvest hatchery fish returning to the Skagway area. Commercial fishing regulations were structured to reduce incidental harvests of mature chinook salmon in the Lynn Canal gillnet fishery.

In 1999 we began to CWT chinook and coho salmon *O. kisutch* smolt during spring to enable us to estimate juvenile abundance, non-terminal harvest and total return (Ericksen 2001b, 2002b, 2003). Although we were successful in capturing sufficient numbers of coho salmon smolt, the number of chinook salmon smolt tagged was poor. Thus, in 2000 we also began to trap juvenile chinook salmon (fry) during the fall (Ericksen 2002a).

The purpose of this study was to estimate the sport harvest, escapement, and production of chinook salmon returning to the Chilkat River during 2002. We tagged juvenile chinook salmon to estimate production and marine harvest of this stock in the future. This report describes the methods and results of the study during 2002. The long-term goal of this study is to develop maximum harvest guidelines for this stock in accordance with sustained yield management.

Research objectives in 2002 were:

1. to estimate the immigration of medium (age-1.2) and large (age-1.3 and older) chinook salmon into the Chilkat River in 2002;
2. to estimate the age, sex, and length compositions of the escapement of large chinook salmon in the Chilkat River in 2002;
3. to estimate the harvest of wild mature chinook salmon in the Haines spring marine boat sport fishery from May 6 to June 30, 2002; and
4. to estimate the mean length of juvenile chinook salmon rearing in the Chilkat River drainage during fall 2002.

METHODS

INRIVER ABUNDANCE

An age-stratified mark-recapture experiment was used to estimate the number of chinook salmon (age-1.2 and older) immigrating to the Chilkat River in 2002. Marks were applied to fish ≥440 mm mid-eye to fork of tail (MEF) captured in the lower Chilkat River with drift gillnets and fish wheels from June 10 through August 5, between the area adjacent to Haines Highway miles 7 and 9 (Figure 1). Chinook salmon were marked with a solid-core spaghetti tag and a hole punch in the upper left operculum prior to release. Water depth (cm), and temperature (°C) were recorded daily at 0700 and 1330 hours near highway mile 8. Fish were examined for marks on three upriver spawning tributaries of the Chilkat River between August 5 and August 31.

Lower River Marking

Gillnets 21.3 m long and 3.0 m deep (70 ft × 10 ft) were drifted in the lower Chilkat River June 10 through July 19, 2002. The gillnets consisted of two equal-length panels: one of 17.1-cm (6.75" stretch measured) and the other of 20.3-cm (8.0" stretch measured) nylon mesh. We attempted to complete 43 drifts between 0600 and 1400 hours

each day. Fishing was conducted from an 18-ft boat in six adjoining 0.5-km sections, which were marked along a 3-km section of river (Figure 2). This area was about 100 m wide and 2 to 3 m deep. The 43 drifts took about 6 h to complete when fish were not captured. Fishing continued uninterrupted from area to area when fish were not captured. If a (0.5-km) drift was prematurely terminated because a fish was caught, or if the net became entangled or drifted into shallow water, the terminated drift was subsequently completed before a new drift was started. If 43 drifts could not be completed during the day, additional drifts were added to the next day's total to make up the balance.

Two 3-basket aluminum fish wheels were operated from June 7 to October 19 by ADF&G Commercial Fisheries Division (CFD) personnel to estimate escapement of sockeye *O. nerka*, coho *O. kisutch*, and chum salmon *O. keta* to the Chilkat River. One fish wheel operated adjacent to the Haines Highway near mile 9 and the other about 300 m downstream (Figure 2). The wheels were located along the east bank of the river where the main flow was constrained primarily to one side of the floodplain. Fish wheels operated continuously except for maintenance.

Captured chinook salmon were placed in a water-filled tagging box (see Figure 3 *in* Johnson 1994), inspected for missing adipose fins, and measured to the nearest 5 mm MEF. Fish were initially classified as 'large,' 'medium,' or 'small,' depending on their length: fish ≥660 mm MEF were designated as large, fish ≥440 and <660 mm MEF as medium, and fish <440 mm MEF as small. Heads were removed from all fish with missing adipose fins marked with an individually numbered strap, and sent down to the CFD tag lab for analysis. Healthy chinook salmon with adipose fins ≥440 mm MEF were scale sampled, visually 'sexed,' marked with a uniquely numbered spaghetti tag threaded over a solid plastic core and sewn through the bones near the base of the dorsal fin, and had a ¼-inch hole punched into the upper edge of the left operculum as a secondary mark. Technicians operating the gillnet also marked fish by clipping (removing) the left axillary appendage. This helped to identify where the fish was marked (whether in the fish wheel or gillnet) in the event of tag loss. Small (<440 mm MEF) were sampled and marked as above except they were given a uniquely numbered T-bar anchor tag instead of a spaghetti tag. Age of each fish was determined postseason by scale patterns (Olsen 1992). Each fish was then reclassified as large, medium, or small, using ocean age, rather than length, as criteria; fish with three or more ocean years of residence were classified as large, those with two ocean years as medium, and younger fish were classified as small. Any fish whose scales could not be aged was classified by length as described above.

Spawning Ground Recovery

Escapements in the Kelsall and Tahini rivers (Figure 1) were sampled for marks by two teams of two people. Spawning grounds in the Kelsall River (including Nataga Creek) were sampled from August 5 to August 31. Spawning grounds in the Tahini River were sampled from August 7 to August 31. Chinook salmon were also sampled in Big Boulder Creek from August 5 through August 24 and in Little Boulder Creek on August 13. Chinook salmon were captured with gillnets, dip nets, snagging gear, bare hands, and spears. Double sampling was prevented by punching a hole in the lower edge of the left operculum of all captured fish.

The validity of the mark-recapture experiment rests on several assumptions: (a) that every fish has an equal probability of being marked during event 1, or that every fish has an equal probability of being captured in event 2, or that marked fish mix completely with unmarked fish; (b) that recruitment and "death" (emigration) do not both occur between sampling events; (c) that marking does not affect catchability (or mortality) of the fish; (d) fish do not lose marks between sample events; (e) all recovered marks are reported; and (f) that double sampling does not occur (Seber 1982).

Stratifying the experiment into medium (age-1.2) and large (age-1.3 and older) fish ensures that abundance and age composition estimates for large fish are obtained by similar, robust methods each year (estimates for age-1.2 fish have not been possible in some years due to small sample sizes). In addition, key experimental assumptions that sampling is unselective by fish size, age, and

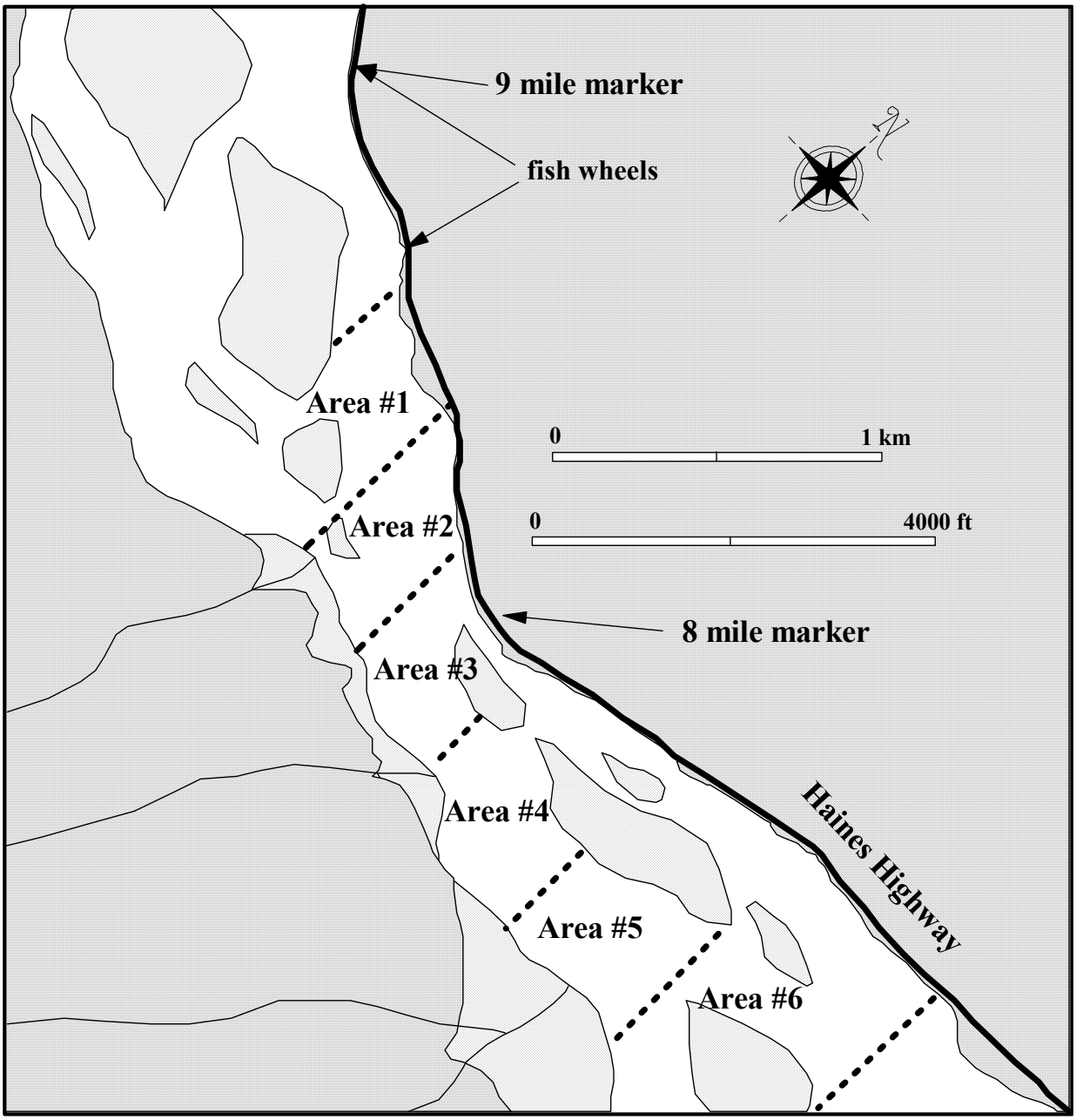


Figure 2.–Active lower Chilkat River channel, drift areas, and sites of fish wheels in 2002.

sex are strained when age-1.2 fish are pooled with large fish, and meaningful failures can be difficult to detect with a small sample size. Selectivity assumptions for a stratum of age-1.2 fish are, in contrast, robust. These fish are mostly (>95%) male and span a small range of lengths relative to fish age-1.3 and older.

The validity of assumption (a) was tested through a series of hypothesis tests (all at $\alpha = 0.1$). First, a contingency table (chi-square statistic) was used to test the hypothesis that fish sampled at different spawning tributaries were marked at the same rate. Also, a contingency table was used to test the hypothesis that fish marked at different times in the immigration (e.g., early vs. late) were recaptured at the same rate.

The possibility of selective sampling was also investigated because assumption (a) could be

violated if the sampling rate varied by size or sex of the fish. The hypothesis that fish of different sizes were captured with equal probability during the second sampling event was tested with a Kolmogorov-Smirnov (K-S) 2-sample test comparing the size distribution of marked fish with those recaptured. If significant differences were observed between size compositions, the abundance estimate could be stratified by size, age, and/or by sex to reduce bias. The remaining assumptions are considered in the Discussion.

Abundance (numbers immigrating) of chinook salmon by age was estimated using the Chapman's modified Petersen estimator for a closed population (Seber 1982):

$$\hat{N} = \frac{(n_1+1)(n_2+1)}{(m_2+1)} - 1 \qquad (1)$$

$$var[\hat{N}] = \frac{(n_1+1)(n_2+1)(n_1-m_2)(n_2-m_2)}{(m_2+1)^2(m_2+2)} \qquad (2)$$

where n_1 is the number of chinook salmon marked by age class in the lower river, n_2 is the number examined by age class on the spawning grounds, and m_2 is the subset of n_2 which had been marked in the lower river.

Age and Sex Composition of the Escapement

Age and sex composition estimates can be biased due to sampling methods. Fish wheels can be selective for smaller fish (Ericksen 1995) and for males (Ericksen 1995–2002a), and gillnets can be selective for larger fish. Carcass surveys are known to be sex-selective in some situations (Pahlke et al. 1996, McPherson et al. 1997, Zhou 2002, Miyakoshi et al. 2003). In addition, significant variation in age and/or sex compositions between spawning areas can bias composition estimates for the entire drainage when sampling is not proportional to abundance. The potential for bias was reduced in this experiment by stratifying the abundance estimate by age class, and by other actions explained below.

Chinook salmon caught in the lower river and encountered on the spawning grounds were sampled for age, length, and sex. Age compositions were tabulated separately for fish in the lower river gillnet, fish wheels, and in each escapement sampling location (tributary). Standard sample summary statistics (Cochran 1977) were used to calculate age composition, mean length-at-age, and variances of the catch in each gear type.

Size selectivity was investigated using two K-S tests: one described above, and the other comparing the lengths of fish marked in the lower river to those sampled on the spawning grounds.

Age and sex selectivity was investigated by contingency table analysis. The number of large chinook captured by age or sex in the lower river was compared with the number sampled on the spawning grounds. Because sex compositions differed significantly, spawning ground samples alone were used to estimate sex composition, as sex determination is more difficult early in the season while marking fish in the lower river (Ericksen 1995–2002a).

Sex composition of the escapement was obtained for each age class from pooled escapement samples. Proportions by sex for each age class were estimated by:

$$\hat{p}_{a,s} = \frac{n_{a,s}}{n_a} \qquad (3)$$

$$var[\hat{p}_{a,s}] = \frac{\hat{p}_{a,s}\,(1-\hat{p}_{a,s})}{n_a - 1} \qquad (4)$$

where $p_{a,s}$ is the proportion of age class a fish of sex s, $n_{a,s}$ is the number of age class a fish in the sample of sex s, and n_a is the number of age a fish in the sample.

The abundance of age a chinook salmon by sex in the escapement was estimated as:

$$\hat{N}_{a,s} = \hat{N}_a\,\hat{p}_{a,s} \qquad (5)$$

$$var[\hat{N}_{a,s}] = var[\hat{p}_{a,s}]\hat{N}_a^2 + var[\hat{N}_a]\hat{p}_{a,s}^2 - var[\hat{p}_{a,s}]var[\hat{N}_a] \qquad (6)$$

where $\hat{N}_a$ is the estimated abundance of age a chinook salmon.

HARVEST

2002 Haines Marine Sport Fishery Harvest

A stratified two-stage direct expansion creel survey was used to estimate the harvest of chinook salmon in the Haines marine boat sport fishery. Spatial stratification was by harbor. Temporal stratification included 7-day (weekly) periods at one high-use site and 14-day (biweekly) periods at two low-use sites. A separate temporal stratum existed during the two weekends of the Haines Derby (May 25, 26, 27, and June 1 and 2) at both high- and low-use sites. Each fishing day was defined as starting at 0800 hours and ending at civil twilight, which ranged from 2211 to 2352 hours.

The three access locations were the Letnikof Dock (the high-use site), the Chilkat State Park boat launch, and the Small Boat harbor (Figure 1). Prior surveys indicate that with the exception of 2000, anglers landing their catch at the Letnikof Dock account for 51–93% of the harvest of chinook salmon. Sampling at each location had days as primary sampling units and boat-parties as secondary units.

Sampling at Letnikof Dock occurred from May 6 to June 30, 2002, and contained morning/evening stratification and weekend/weekday stratification of evening strata during the peak of the season. Morning sampling strata lasted from 0800 hours until 2 h before midday, and evening sampling strata lasted from 2 h before midday until civil twilight. Thus, evening strata were 4 h longer in duration than morning strata. This stratification scheme was designed to increase the precision of estimates by maximizing sampling during hours when most anglers exit the fishery. Random selections determined primary units to sample in each stratum. Two morning and three evening strata were sampled each week, except as noted below.

During the peak of the fishery (May 6–June 9) the evening strata at Letnikof Dock were further divided into weekday and weekend stratification. During this time, two morning, two-weekday evening, and two weekend/holiday evening periods were sampled each week. In total, 19 unique strata were sampled at Letnikof Dock in 2002.

Sampling at the Small Boat Harbor was initiated on May 6 and continued through June 30. Sampling at the Chilkat State Park boat launch was initiated on May 20, one week later than in past years, because the road was impassible due to lingering snow, and ended on June 5 because of repairs to the boat launch. There was no type of day stratification at the low-use sites. Each sampling biweekly period was divided into 14 morning and 14 evening periods of equal length at the Small Boat Harbor, except during the Haines King Salmon derby, when the biweek was divided into one 5-day (derby) with no time-of-day stratification and one 9-day (non derby). Because of the short sampling schedule at Chilkat State Park boat launch, one 5-day (derby) with no time-of-day stratification and one 12-day period were sampled. Random selections determined primary units to sample in each morning and evening stratum. To accommodate the impossibility of sampling three sites simultaneously with only two technicians, 11 changes (period moves) were made to the randomized sampling schedule at low-use sites. Twelve (12) unique strata were sampled at the low-use harbors during 2002.

During each sample period, all sport fishing boats returning to the harbor were counted. Boat-parties returning to the dock were interviewed to determine: the number of rods fished; hours fished; type of trip (charter or non-charter); target species (chinook salmon, Pacific halibut *Hippoglossus stenolepis*); and number of fish kept and/or released by species. Interviewing boat-parties also included sampling all harvests of chinook salmon for maturity and missing adipose fins. Maturity was also determined (Ericksen 1994, Appendix A) in order to estimate the harvest of wild mature fish assumed to be returning to the Chilkat River. In rare cases, some parties were not interviewed, or maturity status could not be determined. When one or more boat-parties could not be interviewed, total effort and catch for the stratum was estimated by expanding by the total number of parties returning to the dock during that period. Similarly, when a boat-party had fish of undetermined maturity status, interview information for that boat-party was ignored and expansions (by sample period) were made from harvests by remaining boat-parties and the total number of boat-parties counted.

The harvest in each stratum ($\hat{H}_h$) was estimated (Cochran 1977):

$$\hat{H}_h = D_h \overline{H}_h \tag{7}$$

$$\overline{H}_h = \frac{\sum_{i=1}^{d_h} \hat{H}_{hi}}{d_h} \tag{8}$$

$$\hat{H}_{hi} = M_{hi} \frac{\sum_{j=1}^{m_{hi}} h_{hij}}{m_{hi}} \tag{9}$$

where h_{hij} is the harvest on boat j in sampling days (periods) i stratum h, m_{hi} is the number of boat parties interviewed in day i, M_{hi} is the number of boat-parties counted in day i, d_h is the number of days (morning or evening periods) sampled in stratum h, and D_h is the number of days in stratum h. The variance of the harvest by stratum was estimated:

$$var\left[\hat{H}_h\right] = (1-f_{1h}) D_h{}^2 \frac{\sum_{i=1}^{d_h} (\hat{H}_{hi} - \overline{H}_h)^2}{d_h(d_h - 1)} + D_h \sum_{i=1}^{d_h} M_{hi}{}^2 (1-f_{2hi}) \frac{\sum_{j=1}^{m_{hi}} (h_{hij} - \overline{h}_{hi})^2}{d_h m_{hi}(m_{hi} - 1)} \tag{10}$$

where f_{1h} is the sampling fraction for periods and f_{2hi} is the sampling fraction for boat-parties. Catch and effort was estimated similarly, substituting C and E for H in equations (7) through (10). Total harvests for the season are the sums across strata ΣH_h and $\Sigma var[H_h]$. Similarly, effort and harvest by charterboat anglers were estimated by considering only data collected from chartered anglers in equations (7) through (10).

Chinook salmon sampled in the angler harvest were measured to the nearest 5 mm FL. Five scales were removed from the left side of each sampled fish (right side if left side scales were regenerated), along a line two scale rows above the lateral line between the posterior insertion of the dorsal fin and anterior insertion of the anal fin. A triacetate impression of the scales (30 s at 3,500 lb/in² at a temperature of 97°C) was used for age determination. Scales were aged by scale patterns (Olsen 1992). Information recorded for each chinook salmon sampled included sex, length, maturity, and presence or absence of adipose fins.

Age composition of the sampled fish (p_a) was estimated by harbor (and by biweekly period at Letnikof Dock) by substituting p_a, n_a and n, for p_{as} n_{as} and n_a in equations (3) and (4), where p_a is the proportion with estimated age a, n is the number successfully aged, and n_a is the subset of n having estimated age a. Because sampling was not proportional across strata, the estimate for the whole fishery was estimated as:

$$\hat{p}_a = \frac{\sum_h \hat{H}_h \, \hat{p}_{a,h}}{\sum_h \hat{H}_h} \tag{11}$$

where h denotes a (time, harbor, or time-harbor) stratum and the estimated harvests supply appropriate 'weights' for the different stratum sizes. Variance was estimated as:

$$var[\hat{p}_a] \approx \sum_h \frac{\left(\hat{p}_{a,h}\left(\sum_i \hat{H}_i\right) - \left(\sum_i \hat{p}_{a,i} \hat{H}_i\right)\right)^2}{\left(\sum_i \hat{H}_i\right)^4} var[\hat{H}_h] + \sum_h \left(\frac{\hat{H}_h}{\sum_i \hat{H}_i}\right)^2 var\left[\hat{p}_{a,h}\right] \tag{12}$$

where $p_{a,h}$ is the proportion age a fish sampled in stratum h, and variance is approximated from a second order Taylor's series expansion around the expected values of the parameter estimates and substituting estimated values for the expected values (Mood et al. 1974, p. 181).

Contribution of Coded Wire Tagged Stocks

Technicians retained heads from chinook salmon in the marine sport fishery with missing adipose fins, and a plastic strap with a unique number was inserted through the jaw of the head. Heads and CWT recovery data were sent to the ADF&G CWT Processing Laboratory in Juneau, where any tags present were removed, decoded, and corresponding information entered into the tag lab database.

The contribution of all tagged stocks to the 2002 Haines marine boat sport fishery was estimated:

$$\hat{r}_{ij} = \hat{H}_i \left(\frac{m_{ij}}{\lambda_i n_i} \right) \hat{\theta}_j^{-1} \qquad (13)$$

where $\hat{H}_i$ is the estimated harvest in stratum *i*, $\hat{\theta}_j$ is the fraction of stock *j* marked with CWTs, n_i is the subset of $\hat{H}_i$ examined for missing adipose fins, m_{ij} is the number of decoded CWTs recovered from stock *j*, and $\lambda_i = (a_i' t_i')/(a_i t_i)$ is the decoding rate for CWTs from recovered salmon. See Bernard and Clark (1996) for further details. Statistics were stratified by bi-week.

Variance of $\hat{r}_{ij}$ was estimated by means of the appropriate large-sample formulations in Bernard and Clark (1996, their Table 2) for wild or hatchery stocks harvested in the recreational fishery. The total contribution of one or more cohorts to one or more fisheries is the sum of harvests and variances from the individual cohorts and strata.

FRY CAPTURE, CODED WIRE TAGGING, AND SAMPLING

Juvenile chinook salmon (fry) were captured in primary rearing areas of the Chilkat River drainage during fall and marked with an adipose finclip and a CWT in 2002 (brood year 2001). Adult fish will be sampled from the escapement between 2004 and 2008 to estimate the marked fraction for each brood year. This information will allow us to estimate the fall rearing abundance in 2002. In addition, random recoveries of CWTs in sampled marine fisheries will allow us to estimate total marine harvest of this stock.

Chinook salmon fry were captured in G-40 minnow traps at three locations in the Chilkat River drainage during fall 2002. Trapping began in upriver locations and moved downstream as the season progressed. The Tahini River was trapped from mid to late September, the Kelsall River was trapped during the first 3 weeks of October, and the lower Chilkat River near highway mile 19 (the Council Grounds) during the last week of October.

A crew consisting of four people fished approximately 80 traps per day. Traps were baited with disinfected salmon roe and checked at least once per day. Crew members immediately released non-target species at the trapping site. Remaining fish were transported to holding boxes for processing at a central tagging location.

All healthy chinook ≥50 mm FL were marked with an adipose finclip and a CWT. Fish were first tranquilized in a solution of Tricaine methanesulfonate (MS 222) buffered with sodium bicarbonate. Fish were tagged with a CWT and marked by excision of the adipose fin, following the methods in Koerner (1977). Every 100th fish tagged was measured to the nearest mm FL.

All marked fish were held overnight to check for 24-hour tag retention and handling-induced mortality. The following morning 100 fish in the previous day's catch were randomly selected and checked for the retention of CWTs and mortality. If tag retention was 98/100 or greater, mortalities were counted and all live fish from that batch were released. If tag retention was less than 98/100, the entire batch was checked for tag retention and those that tested negative were re-tagged. The number of fish tagged, number of tagging-related mortalities, and number of fish that had shed their tags were compiled and submitted to the CFD Tag Lab in Juneau at the completion of the field season.

In addition, Chilkat River chinook salmon smolt incidentally caught during spring as part of a coho salmon project were CWT'd to increase the number of fish tagged. The methods and tagging results from spring are reported in Ericksen (2003).

RESULTS

INRIVER ABUNDANCE

We captured 408 large, 37 medium, and 67 small chinook salmon in the lower Chilkat River with drift gillnets and fish wheels between June 10 and August 5, 2002 (Table 1, Figure 3). Of those captured, 406 large, 37 medium, and 59 small

Table 1.–Numbers of chinook salmon caught in the lower Chilkat River by time period, gear type and size, June 10–August 8, 2002.

Time period	Drift gillnet			Fish wheels			Combined			
	Large	Medium	Small	Large	Medium	Small	Large	Medium	Small	Total
6/10–6/14	4	0	0	1	1	1	5	1	1	7
6/15–6/19	15	0	0	3	0	2	18	0	2	20
6/20–6/24	33	0	0	34	2	2	67	2	2	71
6/25–6/29	50	2	0	20	7	3	70	9	3	82
6/30–7/04	38	1	0	26	8	11	64	9	11	84
7/05–7/09	74	4	0	57	5	16	131	9	16	156
7/10–7/14	19	0	0	16	4	18	35	4	18	57
7/15–7/19	3	0	0	4	2	10	7	2	10	19
7/20–7/24				3	0	2	3	0	2	5
7/25–7/29				5	1	2	5	1	2	8
7/30–8/03				2	0	0	2	0	0	2
8/04–8/08				1	0	0	1	0	0	1
	236	7	0	172	30	67	408	37	67	512

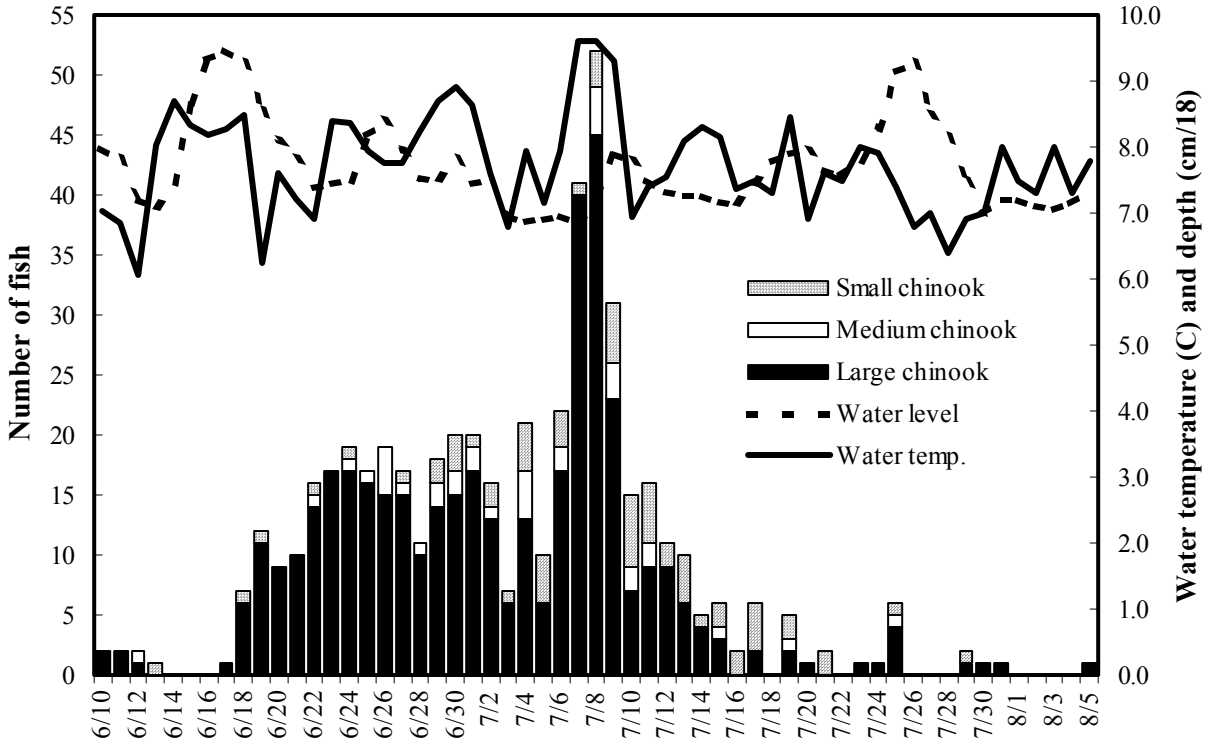


Figure 3.–Daily water depth (cm/18)**, temperature** (°C)**, and catches of small** (age-1.1)**, medium** (age-1.2)**, and large** (≥age-1.3) **chinook salmon in drift gillnets and fish wheels operating in the lower Chilkat River, June 10–August 5, 2002.**

chinook salmon were given a uniquely numbered external tag and opercle punch. One large fish captured in the fish wheels had died and another escaped prior to being marked. Eight small fish were missing adipose fins and were sacrificed to recover coded wire tags. All were wild brood year 1999 Chilkat River fish: four were CWT'd as juveniles during the fall of 2000; and four during the spring of 2001. Capture rates of large chinook salmon peaked on July 8. The mean date of migratory timing (weighted mean, Mundy 1984) in the lower river was July 1 (Figure 4).

Fish captured in gillnets were predominantly age-1.3 (53.8%) and classified as female (56.4%, Table 2). Those captured in the fish wheels were classified mostly as males (64.7%) and most commonly age-1.3 (35.8%), but included a substantial number of age-1.1 and age-1.2 fish (Table 2). Most (127) of the fish in the drift gillnet were captured in the large mesh (8-in.) panel. However, most (5) medium fish in the drift gillnet were caught in the small mesh (6.75-in.) panel. The age composition of large chinook salmon captured in gillnets and fish wheels were not significantly different (χ^2 = 0.005, df = 1, P = 0.946).

We examined 649 large, 58 medium, and 16 small chinook salmon on the spawning grounds for marks: 63 large, 5 medium, and no small marked fish were recovered (Table 3). Twelve (12) large fish (5 marked at the fish wheels, 6 at the gillnet, and 1 unknown) were recovered with missing tags but were identified as marked fish by the opercular punch. Recapture rates of fish marked in June were not significantly different from those marked in July (χ^2 = 0.283, df = 1, P = 0.595).

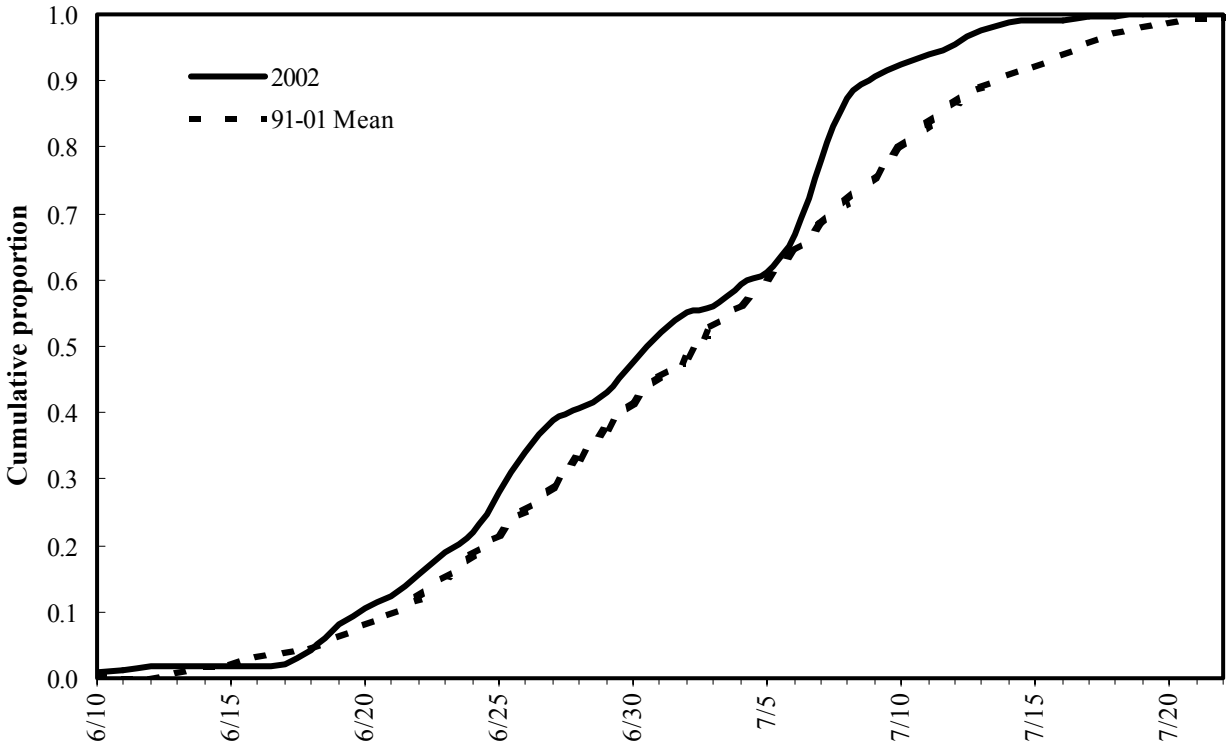


Figure 4.–Cumulative proportion of large (≥age-1.3) **chinook salmon captured with drift gillnets in the lower Chilkat River in 2002 compared to the mean cumulative proportion, 1991–2001.**

Table 2.–Age composition and mean length-at-age (MEF) of chinook salmon sampled during tagging operations on the Chilkat River by gear type, 2002.

		Brood year and age class							
		1999	1998	1997	1996	1995	1995	Total	Total
		1.1	1.2	1.3	1.4	1.5	2.4	aged	sampled[a]
DRIFT GILLNET									
Males	Sample size	0	6	57	34	0	0	97	106
	Percent		6.2	58.8	35.1				43.6
	SD		2.4	5.0	4.8				3.2
	Mean length		641	804	917				
	SD		41.7	8.1	9.9				
Females	Sample size	0	0	62	60	2	0	124	137
	Percent			50.0	48.4	1.6			56.4
	SD			4.5	4.5	1.1			3.2
	Mean length			809	884	935			
	SD				6.2	30.0			
All fish	Sample size	0	6	119	94	2	0	221	243
	Percent		2.7	53.8	42.5	0.9			
	SD		1.1	3.4	3.3	0.6			
	Mean length		641	806	896	935			
	SD		41.7	4.8	5.5	30.0			
FISH WHEELS									
Males	Sample size	55	22	32	21	0	1	131	150
	Percent	42.0	16.8	24.4	16.0		0.8		64.7
	SD	4.3	3.3	3.8	3.2		0.8		3.1
	Mean length	367	578	801	945		920		
	SD	3.7	15.3	12.6	10.3				
Females	Sample size	0	6	51	44	0	0	101	119
	Percent		5.9	50.5	43.6				51.3
	SD		2.4	5.0	4.9				3.3
	Mean length		597	806	888				
	SD		25.9	6.2	6.7				
All fish	Sample size	55	28	83	65	0	1	232	269
	Percent	23.7	12.1	35.8	28.0		0.4		
	SD	2.8	2.1	3.1	2.9		0.4		
	Mean length	367	582	804	906		920		
	SD	3.7	13.1	6.1	6.5				

[a] Includes fish that were not assigned an age.

Table 3.–Number of chinook salmon inspected for marks and number of marked fish recaptured during tag recovery surveys in the Chilkat River drainage by location, size and sex, 2002.

		Inspected[a]											Marked					
		Large				Medium				Small			Large				Medium	
	Dates	M	F	U	Total	M	F	U	Total	M	F	Total	M	F	U	Total	M	Total
Kelsall	8/05-8/31	91	106	6	203	15	0	0	15	5	0	5	6	12	1	19	2	2
Tahini	8/07-8/31	152	160	13	325	26	0	0	26	6	0	6	14	16	1	31	3	3
Big Boulder	8/05-8/23	57	56	0	113	14	0	0	14	4	0	4	7	5	0	12	0	0
Little Boulder	8/13	3	5	0	8	3	0	0	3	1	0	1	0	1	0	1	0	0
Total		303	327	19	649	58	0	0	58	16	0	16	27	34	2	63	5	5

[a] M = male, F = female, U = not sexed.

Similar fractions of large (χ^2 = 0.187, df = 2, P = 0.911) and medium (χ^2 = 2.308, df = 2, P = 0.315) chinook salmon sampled at each spawning tributary were marked. Thus, Petersen models were used to estimate abundance for each size group.

The cumulative distribution function (CDF) of lengths of large chinook salmon marked in the lower Chilkat River was not significantly different from the CDF of those tagged chinook salmon recaptured on the spawning grounds (K-S test, d_{max} = 0.158, P = 0.136) although the distributions visually appear different (Figure 5, top). The CDF of lengths of large fish sampled in the lower river was significantly different from the CDF of those examined for marks on the spawning grounds (K-S test, d_{max} = 0.097, P = 0.020, Figure 5, bottom). These results suggest that the first sampling event was size-selective but the second was not. However, because of the marginal p-value of the first test, the estimate was stratified by age to reduce bias. Thus, we estimate that 4,424 (SE = 450) chinook salmon age-1.2 and older immigrated into the Chilkat River in 2002 (Table 4). Of those, 373 (SE = 123) were age-1.2; 2,353 (SE = 312) were age-1.3; and, 1,698 (SE = 299) were age-1.4 and older. The stratified estimate (4,424 SE = 450) was not significantly different from the pooled estimate (4,555 SE = 475). These estimates are germane to the time of tagging in the lower river since an unquantified removal occurs (from predation and unreported subsistence fishery harvest) between the two sampling events.

Table 4.–Abundance estimates and sampling statistics of Chilkat River chinook salmon by age stratum, 2002.

Stratum	Marked n_1	Examined n_2	Recaptures m_2	Abundance N_a	Abundance SE(N_a)
Age-1.2	37	58	5	373	123
Age-1.3	225	426	40	2,353	312
Age-1.4+1.5	181	223	23	1,698	299
Total	443	707	68	4,424	450

Age and Sex Composition of the Escapement

We sampled 704 chinook salmon on the spawning grounds for age and sex. Of those sampled, 624 were successfully aged (Table 5). Similar to earlier results indicating size-selective sampling, age composition of large fish was significantly different between marking and recovery events (χ^2 = 3.57, df = 1, P = 0.059; age-1.3 fish were more common in the spawning ground samples). Also, age compositions of large fish were significantly different between the spawning tributaries (χ^2 = 97.5, df = 2, P < 0.001; age-1.4 fish were more common in the Kelsall River samples). Therefore, only the lower river samples were used to estimate the age composition of age-1.4 and older fish.

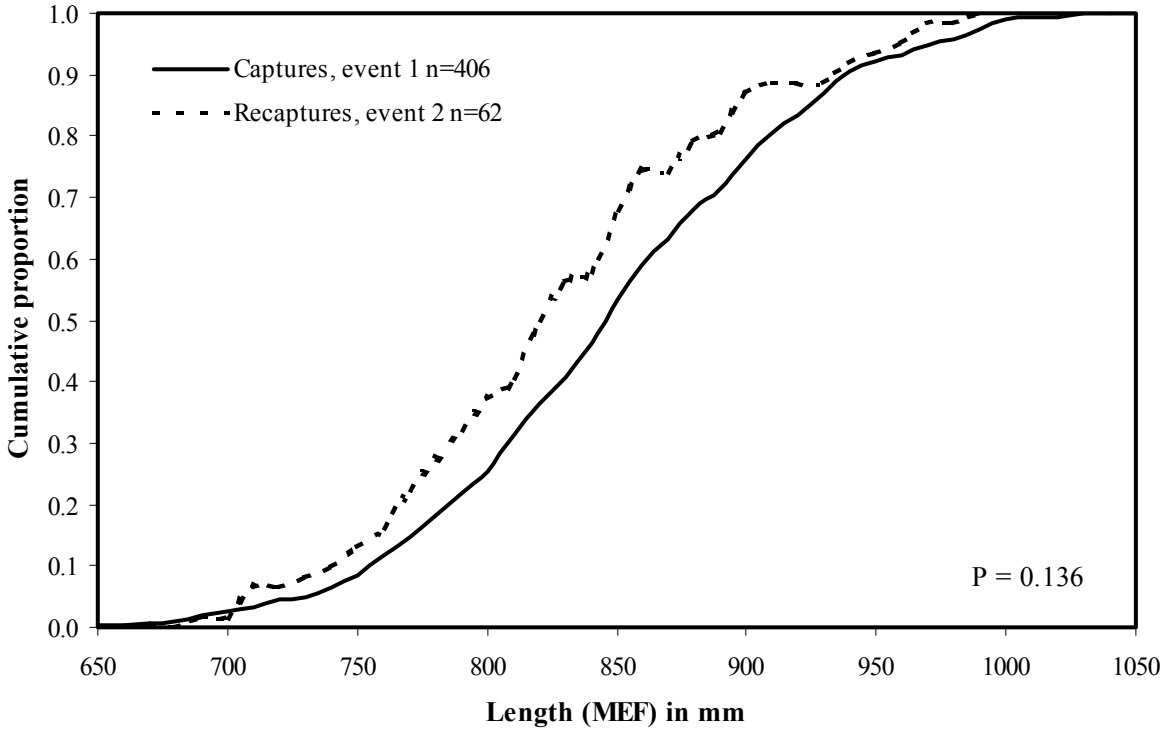
Sex composition of large chinook salmon was significantly different between marking and recovery events (χ^2 = 43.4, df = 1, P < 0.001). In addition, sex determination was less accurate during the marking event (see Discussion). Therefore, only the spawning ground samples were used to estimate sex composition (by age) in the escapement.

The majority (53%) of the estimated escapement of medium and large chinook salmon in 2002 was age-1.3 fish (1997 brood year, Table 6). The remainder of the escapement was composed of 8% age-1.2, 38% age-1.4, and 1% age-1.5 fish. Most (52%) of the fish were males (Table 6).

HARVEST

2002 Haines Marine Sport Fishery Harvest

An estimated total 7,769 (SE = 636) angler-hours of effort were expended in the Haines marine boat fishery between May 6 and June 30, 2002 to catch 343 (SE = 40) and harvest 337 (SE = 40) large chinook salmon (Table 7). This estimate is based on a sample of 344 boat-parties who fished 3,031 angler-hours (2,955 salmon-hours), and harvested 210 large (≥28 inches TL) chinook salmon (Table 7). An estimated 272 (SE = 37) of the chinook salmon harvested in this fishery were wild mature fish assumed to be returning to the Chilkat River. About 97% (7,566 salmon-hours, SE = 634) of angler effort targeted



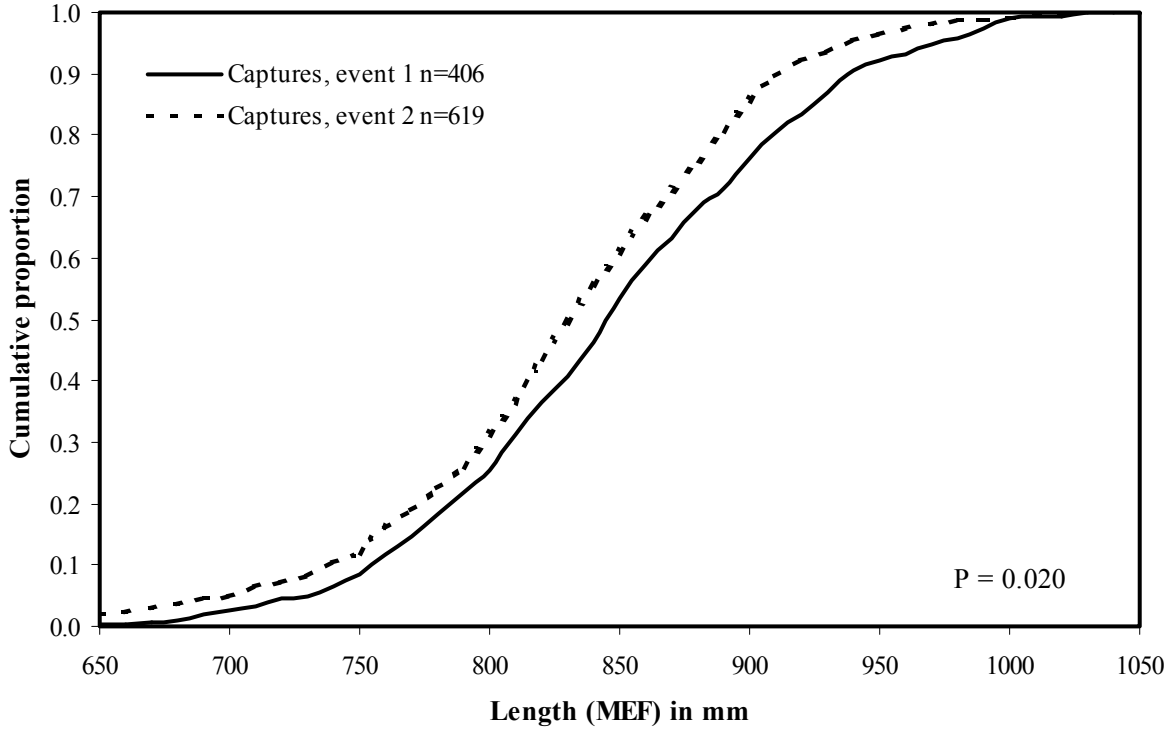


Figure 5.–Cumulative distribution function (CDF) **of MEF lengths of large** (≥age-1.3) **chinook salmon marked in the lower Chilkat River versus lengths of marked fish recaptured on the spawning grounds** (top) **and versus lengths of large fish examined for marks on the spawning grounds**, **2002.**

Table 5.–Age composition and mean length-at-age (MEF) of chinook salmon sampled during recovery surveys on the Chilkat River drainage by spawning tributary, 2002.

		Brood year and age class					
		1999	1998	1997	1996	Total	Total
		1.1	1.2	1.3	1.4	aged	sampled[a]
TAHINI RIVER							
Males	Sample size	4	21	106	26	157	184
	Percent	2.5	13.4	67.5	16.6		53.5
	SD	1.3	2.7	3.7	3.0		2.7
	Mean length	375	561	808	913		
	SD	2.0	15.4	7.5	12.5		
Females	Sample size	0	0	106	30	136	160
	Percent			77.9	22.1		46.5
	SD			3.6	3.6		2.7
	Mean length			818	881		
	SD			4.0	6.8		
All fish	Sample size	4	21	214	57	296	344
	Percent	1.4	7.1	72.3	19.3		
	SD	0.7	1.5	2.6	2.3		
	Mean length	375	561	813	896		
	SD	2.0	15.4	4.2	7.1		
BIG AND LITTLE BOULDER CREEKS							
Males	Sample size	5	15	53	4	77	82
	Percent	6.5	19.5	68.8	5.2		57.3
	SD	2.8	4.5	5.3	2.5		4.1
	Mean length	343	553	748	848		
	SD	7.7	15.5	9.6	53.4		
Females	Sample size	0	0	35	20	55	61
	Percent			63.6	36.4		42.7
	SD			6.5	6.5		4.1
	Mean length			799	876		
	SD			5.5	8.3		
All fish	Sample size	5	15	88	24	132	143
	Percent	3.8	11.4	66.7	18.2		
	SD	1.7	2.8	4.1	3.4		
	Mean length	343	553	768	871		
	SD	7.7	15.5	6.7	10.7		
KELSALL RIVER/NATAGA CREEK							
Males	Sample size	4	15	38	45	102	111
	Percent	3.9	14.7	37.3	44.1		51.2
	SD	1.9	3.5	4.8	4.9		3.4
	Mean length	368	591	811	922		
	SD	26.2	14.6	10.2	7.6		
Females	Sample size	0	0	26	68	94	106
	Percent			27.7	72.3		48.8
	SD			4.6	4.6		3.4
	Mean length			812	865		
	SD			7.5	5.5		
All fish	Sample size	4	15	64	113	196	217
	Percent	2.0	7.7	32.7	57.7		
	SD	1.0	1.9	3.3	3.5		
	Mean length	368	591	812	887		
	SD	26.2	14.6	6.7	5.2		

[a] Includes fish that were not assigned an age. Not all fish examined for marks were scale-sampled (e.g., carcass decayed, part of body missing, etc.).

Table 6.–Estimated abundance of medium and large chinook salmon in the 2002 Chilkat River escapement by age and sex.

	Brood year and age class				
	1998	1997	1996	1995	
	1.2	1.3	1.4	1.5	**Total**
Male	373	1,273	648		2,294
SE	123	180	128		252
Female		1,080	1,019	31	2,130
SE		156	189	19	245
All fish	373	2,353	1,667	31	4,424
SE	123	312	294	19	450

chinook salmon, and the remainder was directed toward other species, primarily Pacific halibut. Anglers caught an estimated 208 (SE = 34) small (<28 inches TL) chinook salmon, none of which were kept. Ninety-three percent (93%) of the estimated salmon effort and 94% of the estimated harvest of chinook salmon occurred between May 20 and June 16 (Table 7).

Angling pressure for chinook salmon was relatively light during the first and last week, so our coverage of the fishery for mature chinook salmon was essentially complete.

Estimates by site are presented in Appendices A1 through A3. Charterboat anglers accounted for

Table 7.–Sampling statistics and estimated effort, catch, and harvest of chinook salmon in the Haines marine boat sport fishery by biweek, May 6–June 30, 2002.

		May 20–June 02				
	May 06–May 19	Non-derby	Derby	June 03–June 16	June 17–June 30	Total
Boats counted	35	49	96	152	12	344
Angler-hs. sampled	177	245	1,235	1,320	54	3,031
Salmon-hs. sampled	155	238	1,235	1,283	44	2,955
Chinook sampled	3	10	146	48	3	210
Sampled for ad-clips	3	10	146	46	3	208
Ad-clips	0	0	1	0	0	1
Angler-hours						
Estimate	347	770	3,241	3,150	261	7,769
Variance	15,287	23,697	137,730	194,910	33,240	404,864
Salmon-hours						
Estimate	307	741	3,241	3,059	218	7,566
Variance	14,927	21,498	137,730	196,954	30,299	401,408
Large chinook catch						
Estimate	3	33	179	112	16	343
Variance	0	276	83	1,106	169	1,634
Large chinook kept						
Estimate	3	30	179	109	16	337
Variance	0	264	83	1,115	169	1,631
Wild mature chinook kept (excluding hatchery and immature fish)						
Estimate	2	18	157	93	2	272
Variance	0	126	111	1,124	1	1,362
Small chinook catch						
Estimate	0	15	89	76	28	208
Variance	0	78	342	43	672	1,135

about 12% of the salmon effort (935 salmon-hours, SE = 1,169), and 21% of the harvest (72, SE = 30) of large chinook salmon in this fishery.

Anglers returning to Letnikof Dock (the high-use site) were responsible for 87% of the estimated salmon effort (6,563 salmon-hours, SE = 416) and 86% of the estimated harvest (289, SE = 27) of large chinook salmon (Appendix A1). Anglers returning to the Chilkat State Park boat launch accounted for an estimated 45 (SE = 40) salmon-hours of effort and harvested 5 (SE = 4) large chinook salmon (Appendix A2). Those returning to the Small Boat Harbor expended 954 (SE = 476) salmon-hours and harvested 43 (SE = 30) large chinook salmon (Appendix A3).

Age and Length of Harvest

We sampled a total of 204 chinook salmon for age and length in the angler harvest; 176 were assigned an age. Because the age composition of fish landed at the Small Boat Harbor was obviously different from that of fish landed at the Chilkat Inlet harbors in past years, these samples were analyzed separately.

We sampled 202 chinook salmon for age and length at the Chilkat Inlet harbors (Letnikof Dock and Chilkat State Park boat launch), and 174 of these were assigned an age (Table 8). Most (56.7%, SE = 5.3%) of the fish harvested were female. The predominant age class was age-1.4 (68.7%, SE = 3.6%).

We sampled only 2 chinook salmon for age and length at the Small Boat Harbor. One was an age-1.3 female 780 mm, and the other an age-1.4 male 1,010 mm in length.

Twenty-seven (27) chinook salmon from the Chilkat Inlet subsistence fishery were also sampled for age and length between June 15 and July 14, 2002. Subsistence fishers reported harvesting 56 chinook salmon in this fishery in 2002. These fish were predominately age-1.3 (Appendix A4).

Table 8.–Estimated age composition and mean length-at-age (measured in mm from snout to fork of tail) **of harvested chinook salmon in the marine boat sport fishery in Chilkat Inlet, May 6–June 30, 2002**. (Does not include two fish that were sampled at the Small Boat Harbor.)

		Brood year and age class					
		1998	1997	1996	1995	**Total**	**Total**
		1.2	1.3	1.4	1.5	**aged**	**sampled**[a]
CHILKAT INLET HARBORS							
Males	Sample size	2	23	48	1	74	74
	Percent	2.7	31.1	64.9	1.4		43.3
	SE	1.9	5.4	5.6	1.4		3.8
	Mean length	773	856	1015	985		
	SE	74.2	22.8	10.4			
Females	Sample size	0	26	71	0	97	97
	Percent		26.8	73.2			56.7
	SE		4.5	4.5			3.8
	Mean length		877	989			
	SE		18.7	7.3			
Combined	Sample size	2	51	120	1	174	202
	Percent	1.3	29.5	68.7	0.5		
	SE	0.9	3.5	3.6	0.5		
	Mean length	773	869	999	985		
	SE	74.2	14.1	6.2			

[a] Includes fish that were not assigned an age.

Contribution of Coded Wire Tagged Stocks

One chinook salmon incubated and reared at the Jerry Myers hatchery facility in Skagway (1996 brood) was recovered in the 2002 Haines marine creel survey (Table 9). This was the only large chinook salmon of the 208 sampled between May 6 and June 30 that was missing its adipose fin. Of the estimated 337 large chinook salmon harvested in the Haines marine boat sport fishery, 2 (SE = 1) were from the Jerry Myers hatchery (Table 9).

Fry Tagging and Mean Length

We captured 31,402 chinook salmon fry during fall 2002 (Table 10). Catch rates were lowest in the Chilkat River and highest in the Kelsall River. Of those captured, 31,390 in 2002 were released with a valid CWT and adipose finclip (Table 11). In addition, we released 2,797 smolt during spring 2003 with valid CWTs and an adipose finclip (Table 11).

We sampled 375 chinook salmon fry for length during fall 2002 (Table 12). The mean length of fry was 68 mm (SE = 0.3 mm). In addition, 174 smolt were sampled for length during the spring of 2003 (Table 12). Smolt averaged 73 mm fork length (SE = 0.5 mm).

Data Files

Data collected during this study (Appendix A5) have been archived in ADF&G offices in Haines, Douglas, and Anchorage.

DISCUSSION

Several assumptions, as noted above, underlie our estimate of abundance. Considerable efforts were made to catch and mark fish in proportion to their abundance (assumption a) by sampling uniformly across the escapement. Also, sampling effort for tag recovery on the Kelsall and Tahini rivers (where >90% of spawning occurred in 1991 and 1992; Johnson et al. 1992, 1993) was fairly constant across the time when spawning fish die and are available for sampling. Previous research on the Chilkat River (Johnson et al. 1992, 1993) suggests that immigration timing is similar for Tahini and Kelsall River stocks. Tagging ratios of large chinook salmon found on the Tahini (0.095) and Kelsall-Nataga (0.094) rivers in 2002 were nearly identical. Although carcass surveys can be sex-selective in some situations (Miyakoshi et al. 2003, Pahlke et al. 1996, McPherson et al. 1997, Zhou 2002), I could not detect a significant difference from the battery of tests applied in this study. The assumption of no recruitment during the experiment is reasonable, because tagging effort was relatively constant and continued until only about one fish per day was being caught. I could not test the assumption that marking does not affect catchability directly. However, recovery rates were not significantly different between large fish marked in the gillnet and those marked in the fish wheels, ($\chi^2 = 0.637$, df = 1, P = 0.425). This suggests fish marked at the fish wheels and gillnets had similar mortality rates. Because all fish had secondary marks that were not lost, assumption (d) was satisfied. Personnel

Table 9.–Contribution estimate (r) of coded wire tagged chinook salmon to the Haines marine boat sport fishery, with statistics used for computing estimates, 2002.

Hatchery / (release site)	Brood year / (tag code)	Period	Harvest		Sample	Adclip	Head	Detect	Decode	Tags	Contribution	
			N	SE[N]	*n*	*a*	*a′*	*t*	*t′*	*m*	*r*	SE
Jerry Myers (Pullen Creek)	1996 (04-47-27)	May 05–June 30	337	40	208	1	1	1	1	1	2	1
Total											**2**	**1**

Table 10.–Results of chinook salmon fry trapping in the Chilkat River drainage during fall, 2002.

Year	Trapping area	Dates	Days fished	Trap sets	Fry caught	CPUE[a]
2002	Tahini River	09/19–09/27	7	553	6,522	11.8
2002	Kelsall River	10/03–10/16	12	883	18,255	20.7
2002	Chilkat River	10/22–10/31	8	740	6,625	9.0
Total			27	2,176	31,402	14.4

[a] Catch per unit of effort expressed as the number of fry caught per trap set.

Table 11.–Number of 2001 brood year chinook salmon coded wire tagged in the Chilkat River drainage by area and tag year.

Tag year	Tag code	Sequence	Location	Last date	Stage	Tagged	24h morts	Marked	Shed tags	Valid CWTs
2002	040553	165–11,148	Tahini R.	09/27/02	fingerling	6,522	3	6,519	0	6,519
2002	040553	11,150–44,129	Kelsall R.	10/15/02	fingerling	18,255	4	18,251	0	18,251
2002	040553	44,131–58,500	Chilkat R.	10/30/02	fingerling	6,625	5	6,620	0	6,620
		Fall subtotal				31,402	12	31,390	0	31,390
2003	040453	NA	Chilkat R.	05/30/03	smolt	2,807	10	2,797	0	2,797
2001 brood year total						34,209	22	34,187	0	34,187

Table 12.–Mean length of 2001 brood year chinook salmon in the Chilkat River drainage by trapping location, and year.

Sample year	Trapping location	Sample dates	Fork length (mm)			
			n	Range	Mean	SE
2002	Tahini River	09/21–09/26	95	49–86	68	0.7
2002	Kelsall River	10/05–10/17	205	55–94	68	0.4
2002	ChilkatRiver	10/26–10/31	75	53–85	67	0.7
	Fall subtotal		375	49–94	68	0.3
2003	ChilkatRiver	04/11–05/31	174	59–91	73	0.5

who sampled on the spawning tributaries carefully examined each fish for marks; therefore failure of assumption (e) is unlikely.

The incidence of tag loss was much higher in 2002 than observed in other years. This was probably due to the use of older tags. These tags had been purchased two years earlier and probably were starting to deteriorate. Tagging personnel and gear had not changed significantly from previous years.

I failed to reject the hypothesis that fish sampled on the spawning grounds were marked at the same rate. This is consistent with the results of a meta-analysis of past data (Ericksen 2001a).

The significant difference in the size and age compositions between the first and second sampling events is disconcerting. This implies that one of the events was size (or age) selective. However, by stratifying the estimate by age, our estimate should be unbiased. The resultant age

Table 13.–Estimated annual age compositions and brood year returns of large (≥age-1.3) chinook salmon immigrating into the Chilkat River, 1991–2002.

Return year		Age class 1.3	1.4	1.5	Total
1991	Abundance[a]	3,211	2,563	123	5,897
	SE	558	445	18	1,005
1992	Abundance[b]	1,689	3,595	0	5,284
	SE	309	662	0	949
1993	Abundance[c]	2,217	2,180	75	4,472
	SE	432	425	10	851
1994	Abundance[d]	2,565	4,148	82	6,795
	SE	415	656	11	1,057
1995	Abundance[e]	530	3,074	186	3,790
	SE	111	660	37	805
1996	Abundance[f]	4,140	737	43	4,920
	SE	641	112	4	751
1997	Abundance[g]	1,943	6,157	0	8,100
	SE	354	930	0	1,193
1998	Abundance[h]	1,016	2,440	219	3,675
	SE	169	381	48	565
1999	Abundance[i]	534	1,656	80	2,271
	SE	109	302	27	408
2000	Abundance[j]	1,350	653	32	2,035
	SE	227	118	14	334
2001	Abundance[k]	2,529	1,988	0	4,517
	SE	376	617	0	722
2002	Abundance	2,353	1,667	31	4,051
	SE	312	294	19	429
Avg.	Percent	43.1	55.3	1.6	
	Abundance	2,006	2,572	73	4,651

BROOD YEAR RETURNS					
Brood year	Age class 1.3	1.4	1.5	Total	SE
1986	3,211	3,595	75	6,881	866
1987	1,689	2,180	82	3,951	526
1988	2,217	4,148	186	6,551	787
1989	2,565	3,074	43	5,683	780
1990	530	737	0	1,267	158
1991	4,140	6,157	219	10,516	1,131
1992	1,943	2,440	80	4,463	521
1993	1,016	1,656	32	2,705	347
1994	534	653	0	1,188	160
1995	1,350	1,988	31	3,369	977
1996	2,529	1,667		4,196	477
1997	2,353			2,353	312
Avg.	2,006	2,572	75	4,654	

[a] Data taken from Johnson et al. (1992).
[b] Data taken from Johnson et al. (1993).
[c] Data taken from Johnson (1994).
[d] Data taken from Ericksen (1995).
[e] Data taken from Ericksen (1996).
[f] Data taken from Ericksen (1997).
[g] Data taken from Ericksen (1998).
[h] Data taken from Ericksen (1999).
[i] Data taken from Ericksen (2000).
[j] Data taken from Ericksen (2001).
[k] Data taken from Ericksen (2002).

composition of large fish from the stratified estimate (58.1% age-1.3 fish, Table 6), is much closer to the age composition of large fish sampled from the lower river (Table 2) than of those sampled from the spawning grounds (Table 5). This suggests that the second sampling event was selective for smaller (younger) fish.

The significant differences in age composition between spawning tributaries probably result from flooding that occurred in the Chilkat River drainage during fall 1998. This flooding caused some major channel shifts in the Kelsall River, and likely led to high mortality of eggs (1998 brood year) and juveniles (1997 brood year) rearing in the Kelsall drainage at the time. The number of chinook salmon spawning in the Kelsall River drainage in 2002 was noticeably lower than in past years. Fish sampled from the Kelsall River were predominantly age-1.4 that had emigrated during spring 1998.

Sex was estimated with uncertainty early in the season; 4 of 54 tagged fish recaptured on the spawning grounds were sexed incorrectly during the marking event, as judged by sex determination on the spawning ground (where sexual dimorphism is more evident). All were sexed as female when tagged, and as males on the spawning grounds during 2002.

The 2002 immigration of large chinook salmon 4,051 (SE = 429) was slightly below the 1991–2001 average (Table 13, above). The escapement was composed mainly of age-1.3 fish from the 1997 brood year (Table 13).

The immigration timing of chinook salmon through the lower Chilkat River was nearly identical to the average observed in past years. The mean date of migratory timing (Mundy 1984) was July 1. In contrast, the mean date for 1991–2001 was July 3 (Figure 4).

Sport fishing harvest patterns observed during 2002 were closer to historical patterns than those observed in recent years. During 2002, 86% of the estimated harvest of chinook salmon was landed at the Letnikof Dock. The proportion of harvest from this harbor averaged 85% in 1988 and 1989 (Suchanek and Bingham 1991). In contrast, 59% on average of the total harvest over the past five years was landed at this harbor. The 2002 estimated harvest of large chinook salmon was greater than the average since 1993 but much lower than observed during the mid 1980s (Figure 6, Table 14). Also, sport fishing effort increased from recent years but remained lower than past years. Catch of large chinook salmon per salmon hour of effort (CPUE) in 2002 was the highest observed since 1987 (Figure 6, Table 14). The reason for the high CPUE given the below average run of Chilkat River fish is unknown.

Trapping chinook salmon fry in the fall increased the number of CWT'd fish released for a given brood year relative to tagging smolt in the spring. The benefits of tagging in the fall are somewhat offset by overwinter mortality of the fry. We will be able to assess the cost effectiveness of fall trapping better after adult fish have returned to estimate overwinter survival.

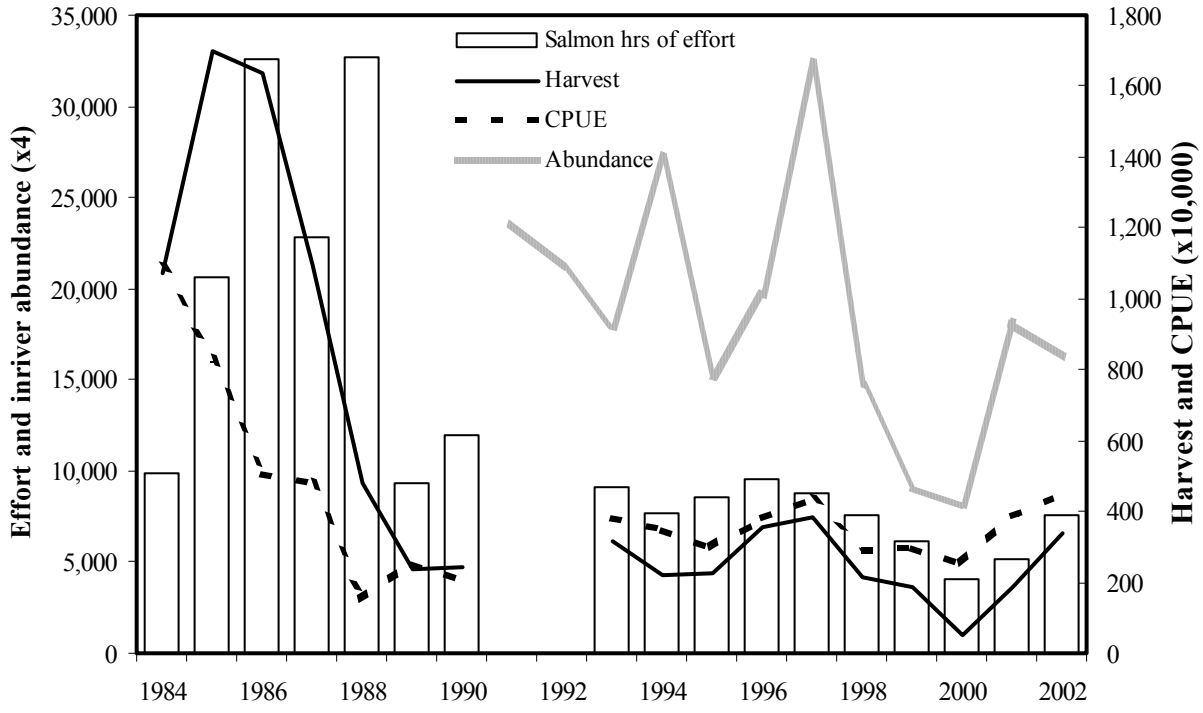


Figure 6.–Estimated angler effort for, and harvest and catch of large chinook salmon per salmon hour of effort (CPUE) **in the Haines spring marine boat sport fishery, 1984–2002, and estimated inriver abundance of large chinook salmon in the Chilkat River, 1991–2002.** Data taken from Tables 9 and 10 (fishery closed in 1991 and 1992).

Table 14.–Estimated angler effort, and large (≥ 28 in.) chinook salmon catch and harvest in the Haines marine boat sport fishery for similar sample periods, 1984–2002.

Year	Survey dates	Effort				Large (28") chinook salmon				CPUE[a]
		Angler-hours	SE	Salmon-hours	SE	Catch	SE	Harvest	SE	
1984[b]	5/06–6/30	10,253	[c]	9,855	[c]	1,072	[c]	1,072	[c]	0.109
1985[d]	4/15–7/15	21,598	[c]	20,582	[c]	1,705	[c]	1,696	[c]	0.083
1986[e]	4/14–7/13	33,857	[c]	32,533	[c]	1,659	[c]	1,638	[c]	0.051
1987[f]	4/20–7/12	26,621	2,557	22,848	2,191	1,094	189	1,094	189	0.048
1988[g]	4/11–7/10	36,222	3,553	32,723	3,476	505	103	481	101	0.015
1989[h]	4/24–6/25	10,526	999	9,363	922	237	42	235	42	0.025
1990[i]	4/23–6/21	[i]	[i]	11,972	1,169	248	60	241	57	0.021
1993[j]	4/26–7/18	11,919	1,559	9,069	1,479	349	63	314	55	0.038
1994[k]	5/09–7/03	9,726	723	7,682	597	269	41	220	32	0.035
1995[l]	5/08–7/02	9,457	501	8,606	483	255	42	228	41	0.030
1996[m]	5/06–6/30	10,082	880	9,596	866	367	43	354	41	0.038
1997[n]	5/12–6/29	9,432	861	8,758	697	381	46	381	46	0.044
1998[o]	5/11–6/28	8,200	811	7,546	747	222	60	215	56	0.029
1999[p]	5/10–6/27	6,206	736	6,097	734	184	24	184	24	0.030
2000[q]	5/08–6/25	4,428	607	4,043	532	103	34	49	12	0.025
2001[r]	5/07–6/24	5,299	815	5,107	804	199	26	185	26	0.039
2002	5/06–6/30	7,770	636	7,566	634	343	40	337	40	0.045
1984–86 average		21,903		20,990		1,479		1,469		0.081
1987–90 average		24,456		19,227		521		513		0.027
1993–02 average		8,252		7,407		267		247		0.035

[a] Catch of large chinook salmon per salmon hour of effort.
[b] Neimark (1985).
[c] Estimates of variance were not provided until 1987.
[d] Mecum and Suchanek (1986).
[e] Mecum and Suchanek (1987).
[f] Bingham et al. (1988).
[g] Suchanek and Bingham (1989).
[h] Suchanek and Bingham (1990).
[i] Suchanek and Bingham (1991); no estimate of total angler effort and harvest was provided.
[j] Ericksen (1994).
[k] Ericksen (1995).
[l] Ericksen (1996).
[m] Ericksen (1997).
[n] Ericksen (1998).
[o] Ericksen (1999).
[p] Ericksen (2000).
[q] Ericksen (2001).
[r] Ericksen (2002).

ACKNOWLEDGMENTS

Ted Lambert supervised the field operations for the project and provided necessary logistical support. I would like to thank the creel survey staff of Ryan Boran and Evan Hales for their invaluable data collection efforts. John Norton and Scott Duffy captured and tagged chinook salmon at the fish wheels. Jarbo Crete, Mark Brouwer, Brian Elliott, Renee Hebert, Sherrie Duncan, Larry Derby, Doug Vollman, Sonja Nelson, and Jane Pascoe worked in the field to capture, mark, and sample fish to complete this project. The Chilkat Indian Village and family of Victor Hotch allowed us to use their land for juvenile tagging operations. Sue Millard, Sport Fish Division, Douglas, processed and aged scales from sampled chinook salmon. Employees at the ADF&G Tag Lab in Juneau dissected heads from adipose finclipped chinook to remove and read coded wire tags. Margie Nussbaum of the Research and Technical Services (RTS) Unit, Sport Fish Division, opscanned mark sense forms. Bob Marshall with RTS in Douglas provided biometric support in the study design, and analysis. Bob Marshall and Scott McPherson provided critical review of this report. Alma Seward performed final layout of this report for publication.

LITERATURE CITED

Bernard, D. R., and J. E. Clark. 1996. Estimating salmon harvest with coded-wire tags. Canadian Journal of Fisheries and Aquatic Sciences 53:2323-2332.

Bethers, M. 1986. Annual sport fish management report for northern Southeast Alaska. Unpublished report. Alaska Department of Fish and Game, Sport Fish Division, Juneau, AK.

Bingham, A. E., P. M. Suchanek, S. Sonnichsen, and R. D. Mecum. 1988. Harvest estimates for selected sport fisheries in southeast Alaska in 1987. Alaska Department of Fish and Game, Fishery Data Series No. 72, Juneau.

Bugliosi, E. F. 1988. Hydrologic reconnaissance of the Chilkat River Basin, Southeast Alaska. U.S. Geological Survey Water Resources Investigation Report 88-4021, Anchorage, Alaska.

Cochran, W. G. 1977. Sampling techniques, third edition. John Wiley and Sons, New York.

Ericksen, R. P. 1994. Effort, catch, and harvest of chinook salmon in the spring marine boat sport fishery near Haines, Alaska, 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-30, Anchorage.

Ericksen, R. P. 1995. Sport fishing effort, catch, and harvest and inriver abundance of Chilkat River chinook salmon near Haines in 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-42, Anchorage.

Ericksen, R. P. 1996. Sport fishing effort, catch, and harvest, fishery contributions, and inriver abundance of Chilkat River chinook salmon in 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-48, Anchorage.

Ericksen, R. P. 1997. Sport fishing effort, catch, and harvest, and inriver abundance of Chilkat River chinook salmon in 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-27, Anchorage.

Ericksen, R. P. 1998. Sport fishing effort, catch, and harvest, and inriver abundance of Chilkat River chinook salmon in 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-31, Anchorage.

Ericksen, R. P. 1999. Sport fishing effort, catch, and harvest, fishery contributions, and inriver abundance of Chilkat River chinook salmon near Haines, in 1998. Alaska Department of Fish and Game, Fishery Data Series No. 99-19, Anchorage.

Ericksen, R. P. 2000. Sport fishing effort, catch, and harvest, and inriver abundance of Chilkat River chinook salmon in 1999. Alaska Department of Fish and Game, Fishery Data Series No. 00-28, Anchorage.

Ericksen, R. P. 2001a. Sport fishing effort, catch, and harvest, and inriver abundance of Chilkat River chinook salmon in 2000. Alaska Department of Fish and Game, Fishery Data Series No. 01-12, Anchorage.

Ericksen, R. P. 2001b. Smolt production and harvest of coho salmon from the Chilkat River, 1999-2000. Alaska Department of Fish and Game, Fishery Data Series No. 01-17, Anchorage.

Ericksen, R. P. 2002a. Escapement, terminal harvest, and fall fry tagging of Chilkat River chinook salmon in 2001. Alaska Department of Fish and Game, Fishery Data Series No. 02-23, Anchorage.

Ericksen, R. P. 2002b. Smolt production and harvest of coho salmon from the Chilkat River, 2000-2001. Alaska Department of Fish and Game, Fishery Data Series No. 02-18, Anchorage.

Ericksen, R. P. 2003. Production of coho salmon from the Chilkat River, 2001-2002. Alaska Department of Fish and Game, Fishery Data Series No. 03-27, Anchorage.

Johnson, R. E. 1994. Chilkat River chinook salmon studies, 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-46, Anchorage.

Johnson, R. E., R. P. Marshall, and S. T. Elliott. 1992. Chilkat River chinook salmon studies, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-49, Anchorage.

Johnson, R. E., R. P. Marshall, and S. T. Elliott. 1993. Chilkat River chinook salmon studies, 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-50, Anchorage.

Jones and Stokes Associates, Inc. 1991. Southeast Alaska sport fishing economic study. Final Research Report. December 1991. (JSA 88-028) Sacramento, CA. Prepared for Alaska Department of Fish and Game, Sport Fish Division, Research and Technical Services Section, Anchorage, AK.

Kissner, P. D., Jr., 1982. A study of chinook salmon in southeast Alaska. Alaska Department of Fish and Game. Annual Report 1981–1982, Project F-9-14, 24 (AFS-41).

Koerner, J. F. 1977. The use of the coded-wire tag injector under remote field conditions. Alaska Department of Fish and Game, Division of Commercial Fisheries, Informational Leaflet No. 172, Juneau.

McPherson, S. A., D. R. Bernard, M. S. Kelley, P. A. Milligan, and P. Timpany. 1997. Spawning abundance of chinook salmon in the Taku River in 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-14, Anchorage.

McPherson, S. A., D. R. Bernard, J. H. Clark, K. Pahlke, E. Jones, J. Der Hovanisian, J. Weller, and R. Ericksen. 2003. Stock status and escapement goals for chinook salmon stocks in Southeast Alaska. Alaska Department of Fish and Game, Special Publication. 03-01, Anchorage.

Mecum, R. D., and P. M. Suchanek. 1986. Southeast Alaska sport harvest estimates. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1985-1986, Project F-10-1, 27 (S-1-1), Juneau.

Mecum, R. D., and P. M. Suchanek. 1987. Harvest estimates for selected sport fisheries in southeast Alaska in 1986. Alaska Department of Fish and Game, Fishery Data Series No. 21, Juneau.

Miyakoshi, Y., T. Takami, K. Takeuchi, H. Omori, M. Nagata, and J. R. Irvine. 2003. Sampling of masu salmon on the spawning grounds: is carcass sampling effective as a mark-recovery method? Fisheries Management and Ecology. 10:273-275.

Mood, A.M., F.A. Graybill, D.C. Boes. 1974. Introduction to theory of statistics. Third edition. McGraw Hill, New York.

Mundy, P. R. 1984. Migratory timing of salmon in Alaska with an annotated bibliography on migratory behavior of relevance to fisheries research. Alaska Department of Fish and Game, Informational Leaflet No. 234, Juneau.

Neimark, L. M. 1985. Harvest estimates for selected fisheries throughout southeast Alaska. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1984-1985, Project F-9-17, 26 (AFS-41-12B), Juneau.

Olsen, M. A. 1992. Abundance, age, sex, and size of chinook salmon catches and escapements in Southeast Alaska in 1987. Alaska Department of Fish and Game Technical Data Report No. 92-07, Juneau.

Pahlke, K. A. 1990. Migratory patterns and fishery contributions of Chilkat River chinook salmon. Alaska Department of Fish and Game, Fishery Data Series No. 90-50. Juneau.

Pahlke, K. A. 1991. Migratory patterns and fishery contributions of Chilkat River chinook salmon, 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-55. Juneau.

Pahlke, K. A. 1992. Escapements of chinook salmon in Southeast Alaska and transboundary rivers in 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-32. Juneau.

Pahlke, K. A., S. A. McPherson, and R. P. Marshall. 1996. Chinook salmon research on the Unuk River, 1994. Alaska Department of Fish and Game, Fishery Data Series No 96-14. Anchorage.

Seber, G. A. F. 1982. The estimation of animal abundance and related parameters, second edition. Macmillan, New York.

Suchanek, P. M., and A. E. Bingham. 1989. Harvest estimates for selected sport fisheries in southeast Alaska in 1988. Alaska Department of Fish and Game, Fishery Data Series No. 114, Juneau.

Suchanek, P. M., and A. E. Bingham. 1990. Harvest estimates for selected marine boat sport fisheries in southeast Alaska in 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-51, Anchorage.

Suchanek, P. M., and A. E. Bingham. 1991. Harvest estimates for selected marine boat sport fisheries in southeast Alaska during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-48, Anchorage.

Zhou, S. 2002. Size-dependent recovery of chinook salmon in carcass surveys. Transactions of the American Fisheries Society 131:1194-1202.

APPENDIX A

Appendix A1.–Sampling statistics and estimated effort, catch, and harvest of chinook salmon at the Letnikof Dock by week, May 6 through June 30, 2002.

			May 20–June 02						
	May 06	May 13	Non-		June 03	June 10	June 17	June 24	
	May 12	May 19	derby	Derby	June 09	June 16	June 23	June 30	Total
Boats counted	9	25	43	91	107	40	2	5	322
Angler-hs. sampled	28	145	218	1206	968	306	3	19	2,893
Salmon-hs. sampled	16	135	218	1,206	950	287	2	15	2,829
Chinook sampled	0	3	10	144	42	4	0	1	204
Sampled for ad-clips	0	3	10	144	42	4	0	1	204
Ad-clips	0	0	0	1	0	0	0	0	1
Angler-hours									0
Estimate	52	267	651	3,096	1,797	800	4	35	6,702
Variance	375	14,240	18,222	135,790	313	2,181	8	217	171,346
Salmon-hours									
Estimate	22	257	651	3,096	1,751	755	3	28	6,563
Variance	15	14,240	18,222	135,790	1,645	2,893	3	242	173,050
Large chinook catch									
Estimate	0	3	33	173	72	12	0	2	295
Variance	0	0	276	63	375	3	0	1	718
Large chinook kept									
Estimate	0	3	30	173	69	12	0	2	289
Variance	0	0	264	63	384	3	0	1	715
Wild mature chinook kept (excluding hatchery and immature fish)									
Estimate	0	2	18	151	57	8	0	2	238
Variance	0	0	126	91	384	12	0	1	614
Small chinook catch									
Estimate	0	0	15	74	69	7	0	0	165
Variance	0	0	78	162	34	9	0	0	283
Small chinook kept									
Estimate	0	0	0	0	0	0	0	0	0
Variance	0	0	0	0	0	0	0	0	0

Appendix A2.–Sampling statistics and estimated effort, catch, and harvest of chinook salmon at the Chilkat State Park boat launch, May 20 through June 05, 2002. The park was not opened to the public until May 20, and the boat launch was closed for repair after June 5 in 2002.

	May 20–June 05		
	Non-derby	Derby	**Total**
Boats counted	1	2	3
Angler-hs. sampled	2	9	11
Salmon-hs. sampled	0	9	9
Chinook sampled	0	1	1
Sampled for ad-clips	0	1	1
Ad-clips	0	0	0
Angler-hours			
Estimate	8	45	53
Variance	48	1,620	1,668
Salmon-hours			
Estimate	0	45	45
Variance	0	1,620	1,620
Large chinook catch			
Estimate	0	5	5
Variance	0	20	20
Large chinook kept			
Estimate	0	5	5
Variance	0	20	20
Wild mature chinook kept (excluding hatchery and immature fish)			
Estimate	0	5	5
Variance	0	20	20
Small chinook catch			
Estimate	0	0	0
Variance	0	0	0
Small chinook kept			
Estimate	0	0	0
Variance	0	0	0

Appendix A3.–Sampling statistics and estimated effort, catch, and harvest of chinook salmon at the Small Boat Harbor by biweek, May 6 through June 30, 2002.

	May 06 May 19	May 20–June 02 Non-derby	May 20–June 02 Derby	June 03 June 16	June 17 June 30	Total
Boats counted	1	5	3	5	5	19
Angler-hs. sampled	4	25	20	46	32	127
Salmon-hs. sampled	4	20	20	46	27	117
Chinook sampled	0	0	1	2	2	5
Sampled for ad-clips	0	0	1	0	2	3
Ad-clips	0	0	0	0	0	0
Angler-hours						
Estimate	28	111	100	553	222	1,014
Variance	672	5,427	320	192,416	33,015	231,850
Salmon-hours						
Estimate	28	90	100	553	187	958
Variance	672	3,276	320	192,416	30,054	226,738
Large chinook catch						
Estimate	0	0	1	28	14	43
Variance	0	0	0	728	168	896
Large chinook kept						
Estimate	0	0	1	28	14	43
Variance	0	0	0	728	168	896
Wild mature chinook kept (excluding hatchery and immature fish)						
Estimate	0	0	1	28	0	29
Variance	0	0	0	728	0	728
Small chinook catch						
Estimate	0	0	15	0	28	43
Variance	0	0	180	0	672	852
Small chinook kept						
Estimate	0	0	0	0	0	0
Variance	0	0	0	0	0	0

Appendix A4.–Estimated age composition and mean length-at-age (measured in mm from snout to fork of tail) **of harvested chinook salmon in the Chilkat Inlet subsistence gillnet fishery, June 15 through July 14, 2002.**

		Brood year and age class				
		1998	1997	1996	**Total**	**Total**
		1.2	1.3	1.4	**aged**	**sampled**[a]
Males	Sample size	1	6	4	11	12
	Percent	9.1	54.5	36.4		50.0
	SE	9.1	15.7	15.2		10.4
	Mean length	675	840	1,036		
	SE		35.3	29.6		
Females	Sample size	2	6	1	9	12
	Percent	22.2	66.7	11.1		50.0
	SE	14.7	16.7	11.1		10.4
	Mean length	590	906	940		
	SE	70.7	14.6			
Combined[b]	Sample size	5	12	6	23	27
	Percent	21.7	52.2	26.1		
	SE	8.8	10.6	9.4		
	Mean length	647	880	988		
	SE	32.4	18.6	40.7		

[a] Includes fish that were not assigned an age.

[b] Includes fish that were not sexed.

Appendix A5.–Computer data files used in the analysis of this report.

FILE NAME	DESCRIPTION
F2008100M012002.DTA	Mark-sense ASCII file containing angler interview data from the Haines marine sport fishery in 2002.
F2008200A012002.DTA	Mark-sense ASCII file containing chinook age & length data from the Haines marine sport fishery in 2002.
F2008202M012002.DTA	Mark-sense ASCII file containing chinook age & length data from the Chilkat Inlet subsistence fishery in 2002.
HAINE2.PRG	Dbase program to generate SAS data file from mark-sense file.
HAINESCT.PRN	Count file (text) used in HAMC02.SAS to expand for missing interview data.
HAMC02.SAS	SAS program to estimate effort and harvest in the Haines marine sport fishery using HAINESCT.PRN and output from HAINE2.PRG.
02STRATPOPEST.XLS	Excel workbook used to estimate 2002 abundance of Chilkat River chinook.
02SPAWN.XLS	Excel workbook containing raw data from chinook sampled on the Chilkat River spawning tributaries during 2002.
SPAWN02.PRN	Space delimited text file with raw data from chinook sampled on the Chilkat River spawning tributaries during 2002.
SPAWN02.TXT	Text file describing heading and column layout for SPAWN02.PRN
02TAGS.XLS	Excel workbook containing raw data from chinook captured in the lower Chilkat River during 2002.
TAG02.PRN	Space delimited text file with raw data from chinook captured in the lower Chilkat River during 2002.
TAG02.TXT	Text file describing heading and column layout for TAG02.PRN
02AGESEX.XLS	Excel workbook used to estimate the number of large chinook salmon in the 2002 Chilkat River escapement by age and sex.